NOvA Progress Report

John Cooper

9/21/05

Sept 9,12,13 Talks with Mike Procario

- Does he have everything he needs for CD-0?
  - YES
  - What about “Acquisition Strategy?
  - Need in place for CD-1 Review, not for CD-0
- Does DOE see using PED funds on NOvA?
  - Prefer not, since PED comes only on line item projects
- When in our current timeline do we show a CD-1 Review (needs to clue Danny in)
  - April 2006, but we have been discussing if that could be advanced by ~ 2 months

Sept 9,12,13 Talks with Mike Procario

- Mike wants an email from me on “our progress on avoiding a line item”
  - Provided same, 2nd next slide
  - “Decisions will be made following NuSAG report, expects Robin to ask,’is there any chance of avoiding a line item for this project?’ ”
    - My interpretation: _____
- Asked about our cost estimate
  - “up” but preliminary, ν_e detection efficiency may also be up
  - Later reported that Robin was interested in why the building cost was up
    - Provided a narrative on this subject, next slide

Mike,

The base cost of the NOvA building in our March 2005 proposal was $ 11.53 M, see page 105 of the proposal. This building had an excavated depth of 30 feet to allow a bathtub sized to hold all the scintillator should it all somehow leak out of its 24,000 containers all at once (see page 53). This included $ 2.66 M of EDIA, which was for both design effort and construction oversight effort. So the base construction cost was 11.53-2.66 = $ 8.87 M. It is worth noting that this value alone would trigger the line item conundrum we are trying to work around.

During our interactions with the PAC last spring, we did more work on the cosmic backgrounds than shown in the proposal and became worried about one subset of this background. Our simulations showed that a cosmic photon component could mimic electron neutrino charged current events and give a background of order 2500 events during a five year run. The photons in question are not simply showering as they enter the detector; instead they are a component that deeply penetrates into the detector before showering and therefore are not simply removed. This background could be reduced straightforwardly by a 3 meters of dirt over the detector to only a few events during a five year run.

OK, so we began to look for a scheme including a modest overburden. The one that emerged was to sink the detector deeper into the ground – 58 feet instead of only 30 feet. We then put a ceiling of pre-stressed concrete planks over the top and use those planks as the bottom of a form to pour a 1 meter thick pre-stressed concrete ceiling spanning the 70 foot wide building This 1 meter thick concrete can support an additional 2 meters of rock from the excavation, giving a 3 meter overburden as desired. This scheme follows examples built here at Fermilab in the past for CDF and DZero.

The cost of this overburden (excavation + concrete + rock moving + stairway exits for life safety) is an additional $ 7.9 M. So now the building has increased in cost to $16.77 M. Additional changes to the hall design (crane, elevator, cast concrete walls vs. shotcrete, and a foam fire suppression system) added another $ 0.54 M. We also changed the surface access building to a larger size to accommodate storage of incoming trucks of PVC extrusion modules for another $ 2.15 M. This gives a new total of $ 19.46 M.

I emphasize that this is a work in progress and we are engaged in value engineering to reduce this cost. Our CDR and Resource Loaded Cost & Schedule will have a smaller cost. The depth of excavation can likely be reduced by ~10 feet by changing the head height above the crane. The depth of the excavation can be balanced against the cost of piling excavated rock against the sides of the top portion of the building for further cost reductions. The size of the surface access building can be reduced to a much more modest size by staging deliveries from Fermilab and having no far site storage buffer. I can't give you a number yet since we haven't completed all this work.

In addition, further simulation work this summer on the cosmic photon background has shown that a cut on transverse energy balance of the events along the direction from Fermilab can reduce this background by a factor of ten with no loss of signal events. We are still investigating if charged particles accompanying these cosmic photons will allow a further reduction (i.e. we see an incoming shower in the full detector and can reject electron neutrino candidates in this circumstance with very little loss of signal). It is possible that a much smaller overburden will be sufficient and engineering for such an overburden may have a different design at presumably lower cost.

If we can satisfy ourselves that a simpler overburden or no overburden is adequate, then I believe we have to go back and also rethink the bathtub containment scheme. The cost of this building is clearly driven by the depth of any excavation. I believe we can argue that partial containment is adequate, particularly now that we have an official Minnesota Pollution Control Agency determination that our scintillator is not a hazardous material.

John

----- Original Message -----
From: Procario, Michael
To: 'John Cooper'
Sent: Wednesday, September 14, 2005 2:24 PM
Subject: RE: More NOvA news

Thanks. I will let people know that you are making some progress.

Mike

-----Original Message-----
From: John Cooper [mailto:jcooper@fnal.gov]
Sent: Wednesday, September 14, 2005 1:57 PM
To: Procario, Michael
Cc: John Cooper
Subject: More NOvA news

Mike,
In my discussions late yesterday with Marvin Marshak, it became apparent that there are opportunities to have the University of Minnesota build the NOvA building without expecting a full payback or a fast payback -- a wider range of understandings are possible on this issue than we originally thought. So there is hope we could proceed this way -- I think we could even fulfill the OMB operating lease requirements. Pier has sent a message requesting a meeting with the University of Minnesota administration.

I will let you know as soon as I hear an actual meeting time has been set for this initial contact and discussions. Clearly Pier needs to judge the possibilities for himself and pass on his reading to Robin et al. I hope all this can fold into the decisions you all will be grappling with after hearing from NuSAG.

Let me know if you need anything else from me? You have the building details, we talked about the CD-1 review time window, I mentioned that we were pursuing other State of Minnesota entities for in-kind contributions on the site and access to the site, you got a copy of the Minnesota Pollution Control Agency ruling -- did that cover your list?

Thanks,
John

What are the OMB "operating lease" requirements?

- Met with Steve Webster and Roger Dooley on Sept 12
- OMB Circular No. A-11 (2005) Appendix B
  - "Lease-purchase" and "Capital Lease" appear to lead back to a line item since immediately involve OECM
  - "Operating Lease" does not, 6 criteria:
    - Ownership of the asset remains with the lessor, no transfer to the government
    - Lease does not contain a bargain-price purchase option
    - Lease term does not exceed 75% of the estimated economic life of the asset
    - Value of minimum lease payments over the life of the lease does not exceed 90% of the fair market value of the asset at the beginning of the term
    - Asset is general purpose rather than being for a special purpose of the Government and is not built to the unique specification of the Government as lessee
    - There is a private sector market for the asset.
  - "Operating Lease" in hands of CH: Roger Dooley, legal, finance
  - CH to calculate term of lease and minimum lease payments following OMB guidelines (overlaps with above left out here):
    - Estimate of fair market value, Special features or enhancements (Crane), renewal options assumed to be exercised, Property taxes will be excluded from lease payments, Interest rates calculated on basis of Treasury rates for marketable debt instruments of similar maturity.

Summary on building

- Minnesota willingness to NOT recover full cost is key
- Minnesota willingness to NOT recover whatever cost in short order also key
- Marvin indicates these points “negotiable”, needs Pier to start negotiating
    - U Minn needs some indication project is real, maybe not guarantee?
    - e.g., NOvA $ in finplan? e.g., Fermilab spending on project in Minn?
- Pier has sent (told me in 9/14 mtg) a message to Tim Mulcahy, U of Minnesota Vice President for Research, requesting a meeting
    - Can Marvin confirm it was received?
- Any glitch seems to imply a line item
    - Pier asks if we can pass CD-2 by next June…
    - Options for reviews??

Building cost breakdown from Steve Dixon

(Pier got a draft copy)

- Similar sized building on the surface at Fermilab
  - construction cost is $ 5.3 M.
- Building **Shell** in Minnesota
  - Bathtub, “capable” of overburden
  - Construction cost is $ 15.6 M
- Smaller Building Shell in Minnesota
  - 211 ft long vs. 511 ft (so holds ~ 10 kt)
  - Construction cost is $ 10.3 M